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BASIC SKILLS RESOURCE CENTER:
Final Report, Part 2

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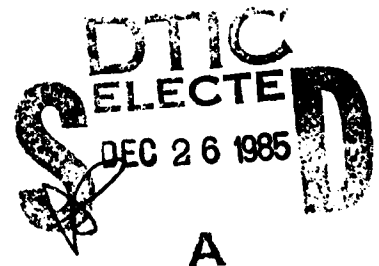TRAINING RESEARCH LABORATORY
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Dr. Richard P. Kern, contracting officer's representative and technical monitor. This note presents the final report on one of the two basic components of the Basic Skills Resource Center contract (tasks 1-5, 7, 9, and 11). Tasks 6, 8, and 10 are reported in RN 85-55.

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20. ABSTRACT (Continue on reverse side If necessary and identify by block number)
The Basic Skills Resource Center undertook the design and operation of an information service entitled the "Military Educators Resource NETWORK" and a research agenda focused on learning strategies training. This final report provides: a) a brief summary of project activities and references to related technical project reports, b) a series of project summaries and/or abstracts which synthesize the research activities completed through the BSRC project, and c) a set of research implications that should be considered in planning future learning strategy research efforts.

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FORWARD

The Instructional Technology Systems Technical Area of the U.S. Army Research Institute for the Behavioral and Social Sciences directs research in learning strategies applications with a special focus on educational technology and links to military education and training. This program of research is aimed at the overall improvement of the Army's Basic Skills Education Programs.

This report serves as the final project report related to the Basic Skills Resource Center (BSRC) which included the completion of a research agenda focused on learning strategies training. The report provides a brief description of the research activities completed through the BSRC project and a summary of the results of these activities. Special attention is extended to the identification of implications that should be considered in undertaking additional research in the learning strategy field in view of the Army's needs. These implications also highlight directions for the learning strategy research field.

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)   <u>Page</u>

EXECUTIVE SUMMARY

Basic Skills Resource Center: Final Report

The Basic Skills Resource Center was developed and operated by InterAmerica Research Associates, Inc. under contract with the U.S. Army Research Institute. The BSRC project included two interfacing components: the implementation and monitoring of applied research in the area of adult basic skills and continuing education; and the design, implementation, and operation of an information service. Throughout the BSRC project cycle, a learning strategies research agenda was successfully completed that advanced the learning strategies training research and explored the application of technologies to this research area. In addition, the BSRC project successfully undertook the development and operation of the Military Educators Resource NETWORK, an information service which provided military educators with current information relevant to basic skills and continuing education activities. The activities associated with the information component have been summarized in a previously prepared report entitled "Basic Skills Resource Center: Final Report of the Military Educators Resource NETWORK." This final report provides a summary of all project activities completed through the BSRC research component and thus serves as the final report of the BSRC research project.

The purposes of this report are to provide a summary of the major project activities undertaken through the BSRC project and to provide a reference to the numerous project reports that have stemmed from the successful completion of project activities. The focus of this report is the BSRC research component which included the design and completion of a learning strategies research agenda. Thus, this report addresses the individual research projects completed through the BSRC research component.

Synthesis of the numerous research activities is accomplished through the presentation of a series of papers and/or abstracts prepared by the Principal Investigators associated with each study. Each paper provides an overview of the research project in terms of its purpose, objectives, results, and recommendations.

Based on the research results and recommendations, a set of implications is identified and discussed in order to provide direction to future learning strategies research to be undertaken by the Army Research Institute. The following considerations are identified:

o   Consideration and documentation of the learner's back-
     ground prior to the development of learning strategies
     training materials.

o   Documentation of "process variables" (e.g., learning
     environment, materials, tasks) that influence strategy
     selection and effectiveness.

o   Documentation of learner characteristics that impact on
     the effectiveness and efficiency of learning strategy
     use.

o   Delineation of the learner's interaction with the
     learning strategy training process/construction.

o   Expansion of learning strategy research approaches to
     incorporate qualitative and/or quantitative measures of
     cognitive variables and structures.

o   Acquisition of measures necessary to validate the
     development and application of instruments utilized in
     the research process.

A review of these special considerations should ensure that future learning strategies research will contribute and enhance learning strategies training efforts. In addition, a focus on these implications in future research agendas should lead to advancements in learning strategies training research.

BASIC SKILLS RESOURCE CENTER

Final Report

INTRODUCTION

The Basic Skills Resource Center (BSRC) has been in operation since April 1982. Operated by InterAmerica Research Associates, Inc., the BSRC assists the Department of the Army in addressing its research and information needs relative to its basic skills educational activities. The specific purposes of the BSRC are: to undertake a research agenda that advances the application of learning strategies to the basic skills educational arena and to establish an information service that provides current information about basic skills education to military educators associated with adult and continuing educational programs.

PURPOSE OF THIS REPORT

This report is intended to serve as the Final Report of the tasks undertaken and completed through the BSRC project. It is not intended to provide an extensive summary of the numerous activities and efforts completed throughout the project cycle, since this would result in an unnecessary duplication of the many reports prepared by staff associated with this project effort. Rather, this report will provide a brief synthesis of the major BSRC activities and identify the detailed reports associated with these activities. In addition, the report will highlight several implications and/or recommendations that should be considered in the implementation of future activities intended to advance and build upon the extensive work completed through the BSRC project.

1

ORGANIZATION OF THE REPORT

The following section of this report provides a summary of the background to the BSRC project and identifies the major project tasks completed throughout the project cycle. In association with these tasks references are made to specific reports that provide detailed documentation of these project efforts. Following this overview, a series of papers are presented which highlight the individual research activities undertaken through the BSRC project. Each paper, prepared by the Principal Investigator associated with the research study, briefly summarizes the study's purpose, objectives, and results. In addition, each paper provides a reference list to the detailed reports associated with its respective research activity.

BACKGROUND

In an effort to expand and improve its basic skills educational programs, the Department of the Army contracted with InterAmerica Research Associates, Inc. to develop and operate the Basic Skills Resource Center (BSRC) project. Funded through the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), Contract Number MDA 903-82-C-0169, the BSRC project has been conceptualized to assist the Army in meeting its information and research needs relative to basic skills educational activities. This goal was accomplished through the completion of tasks undertaken through two interfacing components: an information and a research component.

The information component included activities that were structured to develop and operate an information service whose purpose was to provide

2

practitioners, administrators, and researchers within the Department of the Army with information responsive to their educational, training, and research needs. Initially, project staff completed a needs assessment in order to identify the type and scope of services to be provided by the information component (see Russo, Rivera, DeCarme, and French, in press). Following the completion of the needs assessment, a design plan was identified for the operation of an information service entitled "The Military Educators Resource NETWORK" (see Rivera, Russo, and DeCarme, in press).

The NETWORK offered its users an variety of services. These services included: an inquiry response service, a current awareness service, a referral service, and a publications development and distribution service. The NETWORK was operated for an initial pilot test period during which time evaluative data were maintained relative to the operational status of the NETWORK and user satisfaction with and perceptions of the NETWORK's services. The results of the pilot test and related evaluative data were summarized and discussed in a final report specifically related to the BSRC information component (Russo and Foster, in press).

The BSRC research component included activities that were structured to develop and implement a plan of related research activities relevant to basic skills education in the Army. BSRC project staff, working closely with ARI personnel, developed a research agenda that included the conduct of five research studies designed to contribute to research findings pertinent to basic skills education, learning strategies, and, when feasible, to investigate applications of educational technology.

Following the development of the research plan, project staff identified professionals whose expertise related directly to the BSRC research goals. Potential principal investigators were identified based on their past and on-going research activities and their professional publications, as well as the review of concept papers outlining and describing suggested research activities relevant to the project goals. These candidates were then contacted and asked to submit a detailed research proposal related to their specific area of expertise. Upon submission of these proposals, BSRC and ARI staff reviewed and critiqued the proposed research studies. As part of the review process, a research symposium was held to formally refine the proposed studies prior to their initiation. The symposium, conducted in May 1982, provided an opportunity for each study to be reviewed and critiqued by researchers from various federal agencies as well as the education community (see Russo and Shaw, 1982).

The individual research studies were initiated in June and July 1982. As planned, four of the research studies were completed through subcontracts with leading professionals and institutions in the related research field. The fifth study was undertaken by InterAmerica, capitalizing on its expertise in the area of second language acquisition, specifically English as a second language. Each of the studies was continually monitored by BSRC staff based on the guidelines established through a Monitoring and Communication System for the research agenda (see Russo, 1982).

In order to foster the awareness of each research activity as well as promote the use of research findings and results stemming from the BSRC research efforts, BSRC staff developed a Dissemination Plan targeted for the research component (see Russo, 1984a). This plan encouraged each of

the Principal Investigators and their staff to prepare articles for publication in professional journals, prepare papers for presentation at annual meetings of professional associations and organizations, and participate in specially organized symposiums and conferences. A variety of publications and papers were successfully completed throughout the operational cycle of the BSRC research component (see Russo, 1984b).

The research staff associated with the individual research studies participated in two major conferences. The first conference included the organization and conduct of a research symposium included as part of the annual meeting of the American Educational Research Association. The symposium was held in New Orleans, Louisiana in April 1984. Each Principal Investigator presented a paper which outlined their research efforts and results, as well as findings to date (see Russo (Ed.), in press).

A second conference was conducted in October 1984. The conference, entitled the BSRC Learning Strategies Research Conference, was undertaken to provide a forum for the BSRC staff to summarize the BSRC learning strategies research activities and to identify recommendations for a continuing research agenda which builds upon and advances the research efforts accomplished through the BSRC project. The results of this conferences are presented in the following sections of this report through the provision of summary papers prepared by each of the Principal Investigators of the research studies conducted through the BSRC research component.

The remaining sections of this report include a series of five brief papers that summarize the purpose, objectives, results, and recommendations

5

associated with the five BSRC research studies. In addition, two project abstracts provide overviews of two research activities currently being completed within the BSRC project cycle. The reports stemming from these activities will be available concurrently with this final report of the BSRC project.

Computer-Based Learning Strategy Training Modules:
A Project Summary

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Computer-Based Learning Strategy Training Modules:

A Project Summary

Overview and Purpose

In recent years there have been a number of research and development efforts oriented toward the direct improvement of cognitive strategies employed by learners (see Dansereau, in press; Holley & Dansereau, 1984; O'Neil, 1978; O'Neil & Spielberger, 1979). Although this work is in its infancy there is substantial evidence that an individual's capacity for acquiring and using information can be enhanced by direct training on appropriate information processing strategies (e.g., Dansereau, Collins, et al., 1979; Dansereau, McDonald, et al., 1979; Holley, Dansereau, McDonald, Garland, & Collins, 1979; Dansereau, in press). More specifically, metacognitive strategies which encourage students to monitor their learning activities, and cognitive strategies which require the transformation of text into alternative forms (e.g., verbal summaries and networks) appear to be particularly promising.

In a recent review of the status of learning strategy research and development, we have emphasized the need for improved strategy training methodologies (Dansereau, in press). Although there appear to be a number of effective cognitive and metacognitive strategies emerging from basic research efforts, their utility is severely limited by difficulties in communicating them to learners. Training adults to incorporate new learning strategies into their repertoires is plagued with all of the problems present in complex motor skills re-training (e.g., Singer, 1978), plus additional complexities arising from the covert nature of cognitive

9

and metacognitive activity. Before effective and efficient learning strategy training can become a practical reality, improved training methodologies must be developed.

To remedy this situation, the present project was designed to develop strategy training modules that combine the strengths of two promising instructional techniques: computer-assisted instruction and cooperative learning (peer tutoring). In overview, pairs of cooperating college students interact with a microcomputer and each other in learning metacognitive and cognitive strategies for processing complex, scientific information. The microcomputer provides strategy instructions, initiates training tasks, monitors the training activities, and provides expert content and process feedback and reinforcement to the learner. The students serve as models for one another, and in cooperation with the computer, assist each other in analyzing and diagnosing the productions that emerge from applying the strategies.

Approach

This combined methodology, which is labeled Computer-Assisted Cooperative Learning (CACL), capitalizes on the economical source of content and process expertise and management capabilities that can be programmed into the computer, and the interpretive capabilities and potential for social modeling available in human interactions. Two metastrategies are used to guide the flow of activities during the CACL training (Dansereau, McDonald, et al., 1979; Dansereau, in press). The input strategy, 1st degree MURDER, includes six steps for learning text materials: (1) setting a proper Mood for learning, (2) reading for Understanding, (3) Recalling the information

10

by creating summaries or networks, (4) Detecting errors or omissions in the recall, (5) Elaborating to make the material more easily remembered, and (6) a final Review.

The 2nd degree MURDER strategy includes six steps for using the acquired information during task performance (1) getting into a proper Mood for the task, (2) Understanding the goals and conditions of the task, (3) Recalling the information relevant to the task, (4) Detecting omissions, errors, and ways of organizing the information, (5) Elaborating the information into a proper response, and (6) Reviewing the response to modify it if necessary.

The most important step within these metastrategies is the "Recall" step. As a consequence we have developed a number of alternate recall activities varying in familiarity, complexity, and structure. These variants form the basis for the three CACL training modules that will be briefly described in the next section.

Summary of Findings

Over the course of this project we have developed and formally evaluated three modules designed to improve cognitive strategies during text processing. Each of these modules is based on the MURDER metastrategies described earlier. The primary differences in the modules involve the recall (1st R) sub-strategy. The first module developed used summarization as the recall sub-strategy. In this module the student is trained by successive approximation to capture and elaborate the main ideas and supporting details of a body of text in his or her own words and images. The second module focused on networking, a transformation strategy that

11

requires the student to identify important concepts or ideas in the material and represent their interrelationships in the form of a network map. The third module used structured summarization as the recall sub-strategy. In this module the student is taught to use a structural schema as a mechanism for organizing the intermittent summaries. This schema, given the acronym DICEOX, has six major categories into which the student places the information gained during reading: Description of the major concept or idea, Inventor/historical background of the idea, Consequences of the idea, Evidence for or against the idea, Other competing or complementary ideas, X-tra information that does not easily fit into one of the above categories.

Three experiments were used to evaluate these modules. In each experiment a group of students was given instructions and practice via the CACL methodology on using 1st and 2nd degree MURDER in learning and recalling medically related text excerpts. To evaluate effectiveness, the students trained in this fashion were compared with students given the same instructions and practice individually via written materials, and with students who studied the practice materials using their regular study and test-taking methods. Following training, all students, regardless of group affiliation, individually studied and took free recall tests over two passages. The first passage, which was medically related, was included to assess direct (near) transfer of training, and the second, which contained technical but non-medical content, was included to assess indirect (far) transfer.

Within the pragmatic constraints that governed these three experiments (e.g., 2 hours of training, marginally motivated college student

volunteers, relatively short dependent measure passages) it appears that CACL is an effective training vehicle for simple and somewhat familiar strategies (i.e., the MURDER metastrategies using summarization). However, with more complex and unfamiliar strategies such as networking and structured summarization (DICEOX), the CACL approach is not very effective under the experimental conditions that were imposed. Explanations based on an overload hypothesis appear to account for these findings. It should be noted that the negative findings with networking and structured summarization strengthen the idea that the results of the summarization (paraphrase/imagery) evaluation were not merely placebo (Hawthorne) effects arising from the novelty of the CACL environment. Rather, it appears that the summarization strategy results are sufficient to warrant the implementation of this module in field settings.

In addition to the major training modules described previously, we have also developed and informally evaluated a mood management module designed to enhance the participants' affective strategies. This module, which is based on our prior work with self-coaching and self-directed relaxation (Collins, Dansereau, Holley, Garland, & McDonald, 1981), is designed to improve concentration and motivation. Its primary purpose is to facilitate the participant's progress through the modules described earlier.

In order to preliminarily evaluate this module, nine undergraduate college students were exposed to the module and then given a two-item open-ended questionnaire as well as an 11-item scaled questionnaire designed to assess their reactions to the experience. Based on the results of this questionnaire and informal observations of the participants, it appears that the module was well received and was viewed as providing valuable information.

13

Recommendations

Based on our experiences during this project we recommend the following:

A. The summarization module should be implemented and tested in a field setting.

B. The networking and structured summarization module should be improved by:

1. Extending the training time for each module and increasing the number of practice opportunities

2. Integrating all of the modules into a single, 15-hour training program. If the summarization (paraphrase/imagery) strategy were taught first the participants would presumably adapt to the CACL environment and not suffer overload problems during the training of networking and structured summarization. Further, if the "mood management" module were provided at the "front end" of this program it might serve to reduce motivation and concentration problems.

3. Tailoring the training approach to characteristics of the learner. For example, there is some evidence from the structured summarization evaluation that field independent students should be given CACL training while field dependent students should be given some other form of instruction.

C. The mood component should be formally evaluated.

D. The relative contributions of cooperative learning and computer-assisted instruction to the effectiveness of CACL should be assessed.

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Project-Related Reports

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15

16

Content-Driven Comprehension Instruction:
A Model for Army Training Literature

A Summary of Research

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17

18

Content-Driven Comprehension Instruction:

A Model for Army Training Literature

<u>A Summary of Research</u>

Description

Over a two year period the authors developed a comprehensive manual for curriculum designers, developers, teachers, publishers, and those who manage or supervise the development of instructional materials. The manual is divided into four parts. Part 1 provides the theoretical foundation for the principals generated in later chapters. Specifically, these chapters outline our assumptions about the process of comprehension and learning, representation of information, the relationship between instruction and learning, and the design and development of instructional materials. Part 2 provides guidelines for developing various types of considerate, well-written texts: considerate prose texts, considerate graphics text, and considerate vocabulary texts. Part 3 gives guidelines for embedding explicit learning strategy instruction into instructional materials. There are guidelines for three types of learning strategies: text learning strategies, vocabulary learning strategies, and metacognitive learning strategies. Part 4 provides two summary chapters: one on mastery learning that shows how to integrate learning strategy instruction into mastery learning units, and a summary of all of the key principles presented throughout the manual.

Purpose

In 1980, Cavert, Jones, Shtogren, Wager, Weinstein, & Whitmore (1980) conducted a study to determine the various ways in which learning strategy

instruction may be implemented into Army curricula. Initially, the substance or content of the various curricula was not an issue. However, as the study progressed, it became clear that many of the field manuals and instructional materials were so poorly written that even efficient learners would have difficulty in comprehending them. As a result, Cavert et al. decided to include the content materials as part of the study. Among other things, they recommended embedded learning strategies instruction into the instructional texts for students and ove-haul of the curriculum. Curriculum overhaul referred to reconceptuaizing and rewriting the subject matter texts in Field Manuals and Technical Reports as well as providing all of the components needed to implement mastery learning.

The manual developed by Jones, Friedman, Tinzmann, and Cox was devised to address those two recommendations. Our overall goal was to provide a research-based, comprehensive, readable guide for developing considerate content and instructional texts that provided explicit learning strategy instruction. Toward this end, it was necessary to integrate research from text analysis, graphics, instructional design, learning, reading in the content areas, mastery learning, and assessment. The manual had several target audiences: to policymakers who make decisions about instructional design and development, to curriculum designers and developers, to managers and evaluators, and to the research community.

Development

Initially, the manual was to be addressed specifically to Army curricula and instruction. However, as we planned the manual and wrote some initial chapters, it became evident that there were several problems. First, we

20

had not anticipated how much of the instructional materials involved graphics. All of the text analysis research and considerate text guidelines involved the substance or display of prose texts. How could all of the rules about developing considerate text have much meaning when so much of the instruction was contained in graphics? Our solution was to conceptualize graphics as text and then extrapolate the rules for prose texts to apply to graphic texts. Thus, the manual is a pioneer effort in developing guidelines for considerate graphics texts.

Second, we discovered that the definitions for vocabulary terms were very poorly written. Given the importance of vocabulary, it was important to provide guidelines for developing glossaries and definitions of terms in context. Again, there was no relevant research literature. Again, it was necessary to extrapolate from research on prose and text display.

Third, and the biggest problem we had, was that the manual had no overall cohesion. To explain: It was possible to provide effective and cohesive guidelines for the section on different types of text because all three chapters in considerate text were derived from research on prose texts. Additionally, the three chapters on learning strategies were cohesive because they were all derived from related strands of research. What was unclear was the relationship between the section on learning strategies instruction and the section on learning the content contained in prose, graphic, and vocabulary texts. Essentially, learning strategies instruction was conceptualized as an end in itself. This is not a problem in an adjunct course when the developer can control the content of the selections so that their length and text structures are appropriate for each segment of learning strategies instruction.

In contrast, conceptualizing strategy instruction as an end in itself fragments instruction in content courses because the rules for sequencing learning strategy instruction are inconsistent with the need to instruct students about the content. That is, the rules for developing learning strategy instruction indicate that instruction for comprehending descriptive text structures should precede instruction for comprehending compare/contrast structures because the latter are more complex. However, chapter 1 in the content text may begin with a compare/contrast structure. Obviously, instruction for descriptive structures is not appropriate in such a situation.

We solved the problem by conceptualizing learning strategy instruction as a _means_ to learning the content. The conceptualization radically altered our entire approach. Instead of developing a manual that was specific for developing Army criteria, as we had expected to do, we argued that it was necessary to conceptualize Army curricula as a content area subject; therefore, guidelines for instruction should apply to all content courses. This insight gave the manual the overall cohesion it needed, but it meant reorganizing the manual to provide general rules and examples, not ones that were just specific to the Army. Hence, the name of the manual: content-driven comprehension instruction.

Implications/Recommendations

The manual that was developed provides guidelines that are comprehensive and robust in that they can be applied to any curriculum. However, in spite of numerous examples to illustrate each point, it is difficult to

apply general principles to specific subjects. The problem here is not in the manual. Rather, it is that applying general rules to specific problems is an inherently difficult process, requiring both models and opportunities for practice, i.e., training. This could be accomplished in several ways. First, it would be useful to develop whole sample lessons/units that were specific to Army curricula. Second, it would be important to develop instructional texts with practice exercises for Army instructors. This could be done within a print or multi-media orientation. Third, it would be useful to provide on-site training for cadres of developers/instructors who could then be responsible for implementing the guidelines at the various schools. Clearly, all three types of training are needed at some point for effective implementation.

Project-Related Reports

Jones, B.F., Friedman, L.B., Tinzmann, M. & Cox, B.E. (in press). Content-driven comprehension instruction and assessment: A model for Army training literature. Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

24

Enhancements to Motivational Skills Training
for Military Technical Training Students

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ENHANCEMENTS TO MOTIVATIONAL SKILLS TRAINING
FOR MILITARY TECHNICAL TRAINING STUDENTS

Problem

A skills training program for remedying motivational deficiencies related to unsatisfactory performance in military technical training was found to improve the subsequent test scores, test failure rates, and eliminations from technical training in a study conducted with Air Force trainees (McCombs & Dobrovolny, 1982). In this study, the seven printed, self-instructional modules of the Motivational Skills Training Program were augmented by instructor introductions and small group discussion and practice sessions. Given this implementation format, it was not possible to determine if part of the success of the program--in addition to the content of the motivational program--was due to the group experiences or to the presence of trained instructors who facilitated trainee acquisition and maintenance of motivational strategies and skills. The present research was, therefore, undertaken by the Army Research Institute to address these issues and explore whether microcomputer-based technologies might be used to offset or reduce instructor and group requirements for this motivational training, thereby increasing the practical utility of the training for large scale implementation within Army technical training.

Purpose

This research program was divided into two phases. The goals of Phase I were to determine the separate contribution of instructor augmentation and group experiences to program effectiveness and to identify specific computer-assisted instruction (CAI) enhancements for those skill training

components which benefited from instructor augmentation and group experiences. The goals of Phase II were to design and evaluate the effectiveness of CAI enhanced versions of the Motivational Skills Training program and to make recommendations for future implementations of the program within Army technical training.

Approach

Phase I - The approach for achieving Phase I goals consisted of both an experimental study and conceptual analysis of the motivational program. The design for the experimental study consisted of four conditions: a printed modules only (MO) condition, a modules plus instructor introductions (MI) condition, a modules plus instructor introductions and group discussions (MID) condition, and a no training control (C) condition. Participants in the study were a total of 120 male and female students scheduled to begin the Weapons and Armament School at Lowry Air Force Base during the period of 21 January through 1 July 1983. When the study was completed, data were available on 28 students in the MO condition, 17 students in the MI condition, 23 students in the MID condition, and 52 students in the C condition. Data available for analysis at the conclusion of the experimental study included (a) pretreatment student differences by condition in ASVAB scores, education level, self-efficacy scores, and stress profile scores on eight subscales; and (b) posttreatment student differences by condition in block test scores for Blocks 1 through 6, percentage of students eliminated from the course, and percentage of students who had failed and been retested at the end of Blocks 2 and 6 of the course.

The purpose of the Phase I conceptual analysis was to supplement the results of the experimental study by (a) identifying general roles and functions of the instructor and group experiences in facilitating student acquisition of concepts and skills in the motivational program, (b) selecting those roles and functions which lent themselves to a CAI format or could easily be simulated in this format, and (c) extending the general roles and functions identified into specific design guidelines for each of the seven modules in the program. Procedures used to accomplish these goals were to (1) interview the two graduate research assistants responsible for conducting the motivational training to obtain their comments on aspects of the introductions and group sessions that were particularly helpful, (2) integrate interview results with the results of the project staff's analysis of instructor and group experiences that were facilitative, and (3) produce design guidelines for CAI introduction and practice segments which included general descriptions of content and strategies to be used and estimates of lengths for each of the CAI segments.

Phase II - A simple computer-controlled audio capability which interfaces with the Apple IIe microcomputer was developed to achieve the personalization desired in the simulation of defined instructor and group functions. The character "PC," created to simulate instructor functions, was designed to enact three primary roles: facilitator, modeler, and motivator. To provide the identified group functions of peer identification, opportunities for shared problem solving, and peer modeling and feedback, a set of military characters was defined. The characters were designed to "grow" as a result of their skill training from an initial inability to solve particular problems to competent problem solvers and

29

self-managers. This transition occurred between PC's guided CAI introductions and CAI practice sessions for each module. Much of the modeling provided in the CAI segments is accomplished via the computer-controlled audio capability, while most of the actual skill practice is provided through the CAI exercises.

The design for the experimental study consisted of six conditions: an historical control group (HC), a current control group (CC), a CAI introduction and practice group (CAI), a CAI introduction and instructor practice group (CAII), an instructor introduction and CAI practice group (ICAI), and an instructor introduction and practice group (II). Participants in the study were a total of 532 students scheduled to begin the Electronic Communication course at Ft. Sill during the period of 25 October 1983 through 17 February 1984. The number of students in each condition was: 53 in the HC condition, 253 in the CC condition, 55 in the CAI condition, 61 in the CAII condition, 53 in the ICAI condition, and 57 in the II condition. Data available for analysis included (a) pretreatment student differences by condition in ASVAB scores, Army component, sex, initial critical thinking skills, initial judgments of self-efficacy, initial indices of anxiety and ability to cope with stress; and (b) posttreatment differences in critical thinking skills, judgments of self-efficacy, indices of anxiety and ability to cope with stress, instructor ratings to student's self-management skills, times to complete the first and second course segments, test failures in the first and second course segments, progress indices for the entire course, and whether students attrited or graduated.

Findings

Phase I - Primary findings in the experimental study were that students in the control group did not differ from students in the experimental groups on pretreatment measures and on end-of-block test scores for the first six blocks of the Weapons and Armament course. The number of students eliminated from the course, however, was highest for the control and MO conditions, with no students eliminated in the MI and MID conditions. In addition, test failure rates by the end of Block 6 were lowest for students in the MID condition. These findings suggest that instructor and group experiences enhance the subsequent effectiveness of the Motivational Skills Training Program, with implications for student performance and attrition in technical training. The conceptual analysis led to the definition of instructor and group roles and functions as well as CAI guidelines. In addition, findings from both the experimental study and contractor analysis suggested the importance of personalization and the need for simulation of instructor and group functions within a "rich" training media. Thus, the decision was made at the end of Phase I to interface a computer-controlled audio capability with the Apple IIe microcomputer to provide the personalization and human simulation of portions of the instructor and group functions.

Phase II - Study results indicated that students who received the motivational training with instructor introducing/group practice sessions (II condition) performed better during subsequent technical training than either students who received no motivational skills training (CC condition) or students who received the motivational skills training via CAI with no

31

instructor practice (CAI and ICAI conditions). This better performance was manifested in terms of both significantly fewer test failures and less training time. In addition, as compared to the CC condition, students receiving either the CAI or II conditions tended to have lower attrition rates. Although these differences were not statistically significant, the 8.2 percent reduction for the CAI condition and the 4.4 percent reduction for the II condition may have some practical significance in terms of training costs. For similar students going through the EC course a year earlier (the HC condition) attrition rates were 5.2 percent higher than for students in the current study and progress indices for the HC as compared with current groups was at least in part a function of new procedures being implemented in the student battery (housing area) to improve the performance of students not progressing through the course at a satisfactory rate. Thus, it is likely that findings with the Motivation Skills Training Program were attenuated in the present study.

Since study findings indicated no overall superiority of the CAI vs. II conditions, some exploratory analyses of potential individual differences in subsequent study performance as a function of treatment condition were conducted. These analyses generally indicated that the CAI condition is at least equally effective for approximately half of the students (i.e., those students of high general ASVAB ability and those students with low perceptions of competence or self-esteem). These findings imply that there may be systematic and reliable individual differences that could be used in differential treatment format assignments, thereby reducing some of the instructor support requirements for the motivational program as well as capitalizing on the use of microcomputer technology for this type of skill training.

Summary and Research Recommendations

In general, the Motivational Skills Training Program appears to have achieved the goal of providing needed and relevant training and to have contributed to improvements in students' subsequent technical training performance. The Phase II evaluation findings generally support those found in Phase I, i.e., they substantiate the importance of instructor and group experiences for this type of skills training. In addition, Phase II findings indicate that CAI combined with a computer-controlled audio capability provides an effective alternative format for motivational training, at least for some types of students.

To further substantiate and extend present findings regarding the value of the Motivational Skills Training Program for Army technical training students, a number of additional research areas needs to be explored. These include:

1. an analysis of what is learned in the motivational program, a development of well defined measures of the identified knowledges and skills, and an exploration of relationships between these measures of what is learned and subsequent student performance in technical training;

2. investigations of individual differences predictive of what types of students need the motivational program in order to improve their course performance and/or reduce their chances of attrition, and of those who would benefit from this training, investigations of individual differences predictive of CAI vs. instructor/group versions of the training; and

3. an analysis, identification, and evaluation of a set of skill maintenance strategies that can operate within the total context of an individualized Motivational Skills Training Program, and thereby enhance the long-term effectiveness of this program.

Project-Related Reports

McCombs, B.L., Bruce K.L. and Lockhart, K.A. (in press). Enhancements to motivational skill training for military technical training students: Phase I evaluation study report. Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

McCombs, B.L., Lockhart, K.A., Bruce, K.L. and Smith, G.P. (in press). Enhancement to motivational class training for military technical training students: Phase II evaluation study report. Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Description and Analyses of Learning Strategies
Used by Students of English as a Second Language

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DESCRIPTION AND ANALYSIS OF LEARNING STRATEGIES
USED BY STUDENTS OF ENGLISH AS A SECOND LANGUAGE

Background and Purpose

Prior research indicates that good language learners use a variety of strategies to develop receptive and productive skills in a second language. However, the literature on learning strategies in second language learning leaves unanswered a number of questions related to strategy use and training. For example, more information is needed on the range, type, and frequency of strategy use with language learning tasks at different levels of complexity by students with beginning and intermediate proficiency in the second language. Information is also required on the effects of strategy training with alternative types of second language tasks, such as vocabulary, listening, and speaking. Applied information is needed specifically on the potential for performing ESL learning strategy training at Army installations, the characteristics of military ESL students, and the setting characteristics that may influence the success of ESL strategy training.

The purposes of this study were (a) to describe learning strategy uses and the effects of strategy training with listening and speaking tasks for secondary level ESL students; and (b) to determine the feasibility of embedding learning strategy training in the Defense Language Institute (DLI) curriculum for ESL classes at Army installations.

Approach

The study was performed in two settings where ESL instruction was provided: public secondary schools presenting ESL instruction to students from varied foreign language backgrounds; and Army ESL classes providing instruction largely to Hispanic Puerto Rican students and to a small percentage of Asian students. In each setting, two phases of data collection were used to address the purposes of the study: a descriptive phase and a training phase.

Descriptive Phase. The descriptive phase was designed to conduct a series of interviews regarding the use of learning strategies. Essentially the same procedures were followed in the secondary school and Army ESL settings. Beginning and intermediate level ESL students (70 at the secondary level, 37 in the Army) were interviewed in order to describe the range, type and frequency of strategy use with a variety of language learning tasks. The tasks were as follows: pronunciation, oral drills, vocabulary, following directions, listening to a lecture, making a brief presentation, social communication, and operational communication (e.g., applying for a job). In addition, teachers of ESL students (19 in secondary schools, 4 in the Army) were interviewed to determine if they were aware of learning strategy approaches used by students and if they introduced strategy training in their classrooms.

Training Phase. The overall design of this phase of the study addressed the feasibility and effects of strategy training. However, the specific purposes of the training phase varied depending on whether the study was

38

performed in a public school or military setting. In secondary school ESL programs, the purpose was to evaluate the effectiveness of learning strategies training among intermediate level ESL students for vocabulary, listening, and speaking tasks. Students were randomly assigned to one of three treatment conditions proportionate to ethnicity and sex: a metacognitive group (n = 27), which received training on both metacognitive and cognitive strategies; a cognitive group (n = 26), which received training only on cognitive strategies; and a control group (n = 22), which was instructed to work on the language tasks using whatever procedures they ordinarily preferred. Strategy training for vocabulary, listening, and speaking tasks was provided one hour daily for eight successive days with an additional hour devoted each to a pretest and a posttest. Cues for strategy use were faded on successive days of training.

In Army ESL programs, the purpose of the training phase was to pilot test a learning strategies instructional approach that was embedded in the Army's ESL program. Students were 21 enlistees with beginning and intermediate level proficiency in English. Seventy-five percent of the group were Puerto Ricans; and the remaining twenty-five percent were Asians. Strategy training was presented 6 hours daily for 5 days using instructional materials from the Army's ESL program that were adapted to incorporate learning strategies for listening and speaking. The strategy training was designed by project staff and applied to 5 lessons selected from the full set of 42 individual DLI/ESL lesson booklets. A formative evaluation of the strategy training procedures was conducted based on student test performance, student reaction, and the judgment of regular Army ESL teachers.

Major Findings

Public School Setting. Findings from the descriptive study in the public school setting indicated that strategies used by students to learn English as a second language could be classified into three broad categories: (a) metacognitive strategies, or strategies that students use to plan, monitor, or evaluate a learning activity; (b) cognitive strategies, or strategies students use to manipulate new information, to organize or conceptualize new ideas, or to relate new information to ideas already stored in memory; and (c) social mediating strategies, or approaches used by students to learn in cooperative-interactive settings. There were 9 metacognitive strategies, (e.g., selective attention and self-evaluation), 16 cognitive strategies (e.g., inferencing and elaboration), and a single social mediating strategy (cooperation). The frequency with which these strategies were used varied considerably, with the most frequent uses associated with relatively simple strategies (e.g., repetition, questions for clarification), and less frequent uses for strategies requiring greater conceptual manipulation of information (e.g., elaboration and recombination). Further, the frequency of strategy use varied by task, with the most extensive strategy use occurring for relatively simple tasks (pronunciation and vocabulary), and the least extensive use occurring for more complex tasks (listening and speaking). An additional finding from the descriptive study was that teachers were generally unaware of students' strategies and rarely introduced strategies while teaching, although they expressed strong interest in gaining familiarity with learning strategy applications.

Results of the training study in public school ESL classrooms indicated that strategy training significantly improved speaking skills for making a brief oral presentation relative to a control group. Listening skills significantly improved on some tests, depending on the difficulty of the task and the strength of cues for strategy use. When the listening task was more difficult, and the cues for strategy use less structured, performance on listening tasks was not significantly affected by strategy training. Process analyses of both listening and speaking strategies indicated that students in the treatment groups were using the strategies on which training had occurred, except when cues were too rapidly faded on the listening task. Based on observation and analysis of work sheets, it was found that the control group generally failed to use any visible strategies at all. Difficulties were encountered in implementing vocabulary strategies which required mid-treatment modifications in the instructional approach; nevertheless some of the findings for vocabulary instruction were meaningful. Although no significant differences were found overall between treatment and control conditions in vocabulary learning, subsequent analysis revealed differences between ethnic groups. Hispanic students in the metacognitive treatment group performed much better than their corresponding controls on the vocabulary task, whereas Asian students in the control group outperformed the Asian treatment group students. These findings confirmed informal observations by instructors which suggested that Asian students used rote repetition effectively and resisted attempts to modify this preferred strategy, while Hispanic students seemed to accept applying the new strategies to vocabulary learning.

Military ESL Setting. The results of the descriptive study did not differ by setting. As in the public school setting, the frequency with which individual strategies were used varied considerably, with the most frequent uses associated with relatively simple strategies, and less frequent uses with strategies requiring greater manipulation of information. Further, the most extensive strategy use was associated with relatively simple as opposed to more complex language learning tasks.

Analyses of the total context for learning English in the Army revealed a number of conditions which appeared to limit effective acquisition of English. First, the students have few opportunities to speak English to native English speakers outside the ESL classroom since they are assigned a common barracks and rarely interact with other soldiers except to follow direct commands. Second, the teachers may not be trained in ESL methodology, except for inservice training on the presentation of the DLI/ESL curriculum, and have little incentive for acquiring new skills independent of their job due to low salaries and benefits and the absence of opportunities for advancement. These conditions are generally conducive to a high rate of teacher turnover. Third, the DLI/ESL instructional approach relies upon structured methods that tend to constrain listening skills to a limited range of phrases, generally with an accompanying written text, delivered at a pace that is slower than authentic dialogue required during performance of military duties. Speaking skills tend to be limited to repetition and choral responses to questions read by the teacher from the DLI/ESL text, leaving little time for attention to communication skills required for military life.

The pilot test of the learning strategies instructional approach in the Army ESL setting indicated that students responded positively to the combined learning strategies/ESL instruction and appeared to learn more active language strategies for listening and speaking than they might have in the standard curriculum approach. However, because all instruction for strategy use was in English, less proficient students sometimes experienced difficulty in learning the strategies and the language skills the strategies were designed to facilitate. Regular ESL teachers who observed the training were concerned that they might have difficulty implementing special learning strategy applications of the full 6-week ESL curriculum due to the lack of time for planning during their regular teaching day.

Implications

Findings from this study generally suggest that strategies can be taught for a variety of language skills, such as listening and speaking, but that learning strategies are underutilized by both students and their teachers, especially with more complex tasks. Additional descriptive research is needed to broaden our understanding of the strategies students use and their rationale for approaching language tasks with the strategies they seem to prefer. Although strategy training was effective with speaking and selected listening tasks for secondary school ESL students, additional research is needed to explore the types of tasks, students, and settings for which learning strategies are effective. An analysis of strategies for receptive tasks in both reading and listening would enable hypotheses derived from reading research to be tested with parallel listening tasks. This should contribute to an overall improved understanding of the conditions under which listening strategy training is effective, and

provide new information on reading strategies that are effective with ESL students. Further research exploring the differential effectiveness of vocabulary strategy training with Hispanic as contrasted with Asian populations is also warranted, although modifications in the approach seem appropriate given difficulties in implementation with the training. Some of these implementation difficulties might be resolved by combining vocabulary instruction with training on inferencing strategies for words presented in either written or oral text.

The results of this study also indicate that the Army setting for ESL instruction has some severe limitations that may counteract future efforts to enhance English language proficiency through inservice teacher training on strategy applications alone. Additional research on learning strategies with ESL students should be developed with consideration of the types of *students for whom* the findings will eventually be applied and the context factors that can be expected to influence the results. With soldiers who have few opportunities to receive sufficient English language input that is authentic in the context of performing military duties, simulated listening experiences may be necessary as could be obtained using a computer-assisted random access audio device. Computer-assisted instructional support modules teaching learning strategies to students may be a useful complement to the structured emphasis of the DLI/ESL curriculum, and may help to offset the difficulty of providing extensive inservice support to teachers who are unfamiliar with learning strategies, who have limited time for planning, and who may be subject to high turnover. Soldiers could be taught learning strategies such as note-taking and inferencing for following directions and for information presented either in written or oral text. Preliminary experimentation and hypothesis testing in

non-military settings should provide important background leading
eventually to applications in military environments.

Research Recommendations

A summary of additional research that needs to be explored in learning
strategies with students learning English as a second language includes the
following topics:

1. analyze the strategies students use and their rationale
for approaching language tasks with those strategies;

2. analyze the parallel between learning strategies used
with receptive skills in both reading and listening,
such as note-taking and inferencing;

3. analyze the effectiveness of learning strategy training
for different types of students, tasks, and settings;
and

4. determine the effects of computer-assisted instruction
with random-access audio to enhance listening
comprehension through the use of learning strategies.

Project-Related Reports

O'Malley, J.M., Russo, R.P., and Chamot, A.U. (in press). A review of
literature on learning strategies in the acquisition of English as a
second language: The potential for research applications.
Alexandria, VA: U.S. Army Research Institute for the Behavioral and
Social Sciences.

O'Malley, J.M., Russo, R.P., Chamot, A.U., Stewner-Manzanares, G.,
and Kupper, L. (in press-a). Learning strategies used by high school
students learning English as a second language. Alexandria, VA: U.S.
Army Research Institute for the Behavioral and Social Sciences.

O'Malley, J.M., Russo, R.P., Chamot, A.U., Stewner-Manzanares, G.,
and Kupper, L. (in press-b). The effects of learning strategies
training on the development of skills in English as a second language.
Alexandria, VA: U.S. Army Research Institute for the Behavioral and
Social Sciences.

Stewner-Manzanares, G., Chamot, A.U., O'Malley, J.M., Kupper, L., and Russo, R.P. (in press). A teacher's guide for using learning strategies in English as a second language instruction. Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

O'Malley, J.M., Kupper, L., Chamot, A.U., Stewner-Manzanares, G., and Russo, R.P. (in press). A descriptive study of learning strategy applications by English as a second language students and teachers in the Army. Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Stewner-Manzanares, G., Kupper, L., O'Malley, J.M., and Russo, R.P. (in press). A pilot study of learning strategies training with students of English as a second language in the Army. Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Teaching Reading Comprehension to
Adults in Basic Skills Courses

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Teaching Reading Comprehension to
Adults in Basic Skills Courses

Purpose

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In a series of three studies conducted in Basic Skills classes taught at Ford Ord, Fort Irwin, Fort Hunter-Liggett, and Schofield Barracks, low reading ability soldiers regularly enrolled in Basic Skills classes learned in nine hours to increase their reading comprehension of Army manuals and texts as well as non-technical materials. The teaching procedures and curriculum materials developed and presented in this research project were based on the principles of generative learning developed by the author, which are that low ability readers need to learn (1) to relate sentences in Army manuals and texts to one another in an organized way, and (2) how to relate sentences in Army manuals and non-technical materials to their experience and knowledge.

Approach and Results

In the first and second of the three studies, five different curricula, each using paragraphs from Army manuals and from magazines and newspapers, were used in Basic Skills classes. A comparable control group of soldiers given customary Army Basic Skills instruction, taught by regular Basic Skills teachers, and also offered on the same Army bases in the same classrooms for the same amount of time, was used to evaluate the effectiveness of new materials and teaching procedures. Pretests and posttests were also given to all experimental and control classes to

provide a second measure of effectiveness of the experimental curricula and the generative teaching methods.

The soldiers in each of the experimental groups showed statistically significantly greater improvement in reading comprehension than did the soldiers in the control group. The second measure of effectiveness, the gains from the pretest to the posttest, also showed the same statistically significant increase in reading comprehension only in the experimental treatments. The control treatment showed no gain.

In the third study in the series, the curricula and teaching procedures developed in the first and second studies were rewritten for use with microcomputers. The rewritten materials were presented in microcomputers to regularly enrolled Basic Skills (BSEP) students at Fort Ord and Fort Irwin. Statistically significant gains in improvement in reading comprehension again occurred. In addition, the time needed for the instruction dropped sizably, from an average of 450 minutes (nine 50-minute class hours) to an average of 251 minutes (about five 50-minute class hours).

Recommendations

The research indicates that reading comprehension can be sizably increased with some soldiers at no added cost using written materials in typical Basic Skills classes offered on Army bases by regularly employed BSEP teachers working with normally enrolled BSEP soldiers. Under these realistic and typical conditions, the reading comprehension instruction and curricula should teach soldiers how to generate meaning by relating their

knowledge and background to the manuals and other texts they read, and by generating relations among the sentences in the text. These two basic principles can lead to inexpensive but useful modifications in teaching and to increases in ability to read with comprehension. The research also implies that with microcomputers and appropriate curricula, reading comprehension can be increased and training time can be markedly reduced, at least with some soldiers.

Project-Related Reports

Wittrock, M.C. (in press). Teaching reading comprehension to adults in basic skills courses--Volume I. Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Wittrock, M.C. (in press). Teaching reading comprehension to adults in basic skills courses--Volume II. Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Wittrock, M.C. (in press). Teaching reading comprehension to adults in basic skills courses--Volume III. Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Contemporary Issues and Research in Anxiety and Learning

Project Abstract

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Contemporary Issues and Research in Anxiety and Learning

Purpose of Project

The purpose of this project was to develop a thematic review of central topics, theory, and research in the stress, anxiety, and performance areas to identify contemporary issues and trends. The primary focus of the project efforts centered on theory and research in the 1980-1984 period. The project was designed to supplement prior work in the cognitive and learning strategies domain.

Description of Work

To accomplish the primary task of developing the review, the major subtasks of the project involved the development of a detailed outline for the review through analysis and synthesis of related research. Based upon the outline, a technical report was written that includes historical, theoretical, and methodological issues and concerns, summaries of research in the areas of attention, arousal, anxiety, and performance, and research examples representing clinical and educational research. The report also examines collateral areas of research that have potential for expanding our conceptualization of the affect and cognitive areas. For example, research on the effects of other mood states such as depression on learning and memory, learned helplessness and cognition, attribution theory and affect, stress and coping were reviewed for their implications for understanding performance functioning. In addition, developmental aspects and neuropsychological and neurobiological areas of affect research were reviewed for major findings to date and implications for education.

55

Products

A detailed Technical Report which documents the results of the review
process is being completed. The report includes a reference list and
copies of all major journal citations are provided.

Virtual Videodisc Software Requirements

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Virtual Videodisc Software Requirements

Purpose

This project involved the preparation of software documentation that will allow videodiscs prepared for different configuratibns of videodisc players and computer interfaces to be played on a single configuration of computer, videodisc interface, and videodisc player.

Description of Work

The Army Research Institute and other training research and development organizations in the Army have exercised considerable leadership in the development and evaluation of videodisc technology applied to training. Because of the innovative and original nature of this work, a variety of videodiscs have been prepared in accordance with a variety of technical standards for interface and control of videodiscs and their players by computer. In order to review the varieties of videodiscs now available to the Army, it is currently necessary to possess an equivalent variety of computers, videodisc interface, and videodisc player hardware and software. The work completed through this project allows present and future videodiscs prepared for Army research and development efforts to be displayed and reviewed on a single configuration of computer, videodisc interface, and videodisc player.

59

Products

The major product developed through this project effort is an assembler language software documentation package. This package allows a single computer, videodisc interface, and videodisc player to control display of a videodisc, regardless of which videodisc player the original videodisc was prepared for. The software documentation is written so that videodiscs prepared for later models and/or manufacturers can be easily included. In addition, the documentation includes a description of the features and functional characteristics of the package and describes calling sequences, parameters, and software interfaces needed to use the package at the programmer level.

SUMMARY

Each of the research activities undertaken through the BSRC research component incorporated a unique focus on learning strategies training as well as considerations and/or applications of technological approaches to strategy training. This section of the BSRC Final Report identifies several considerations that have implications for future learning strategies research of the type successfully completed through this project. Four research implications are identified and discussed in the following sections. These are:

o   Strategy Identification, Definitions and Parameters

o   Learning Strategy Training Process

o   Research Methodology

o   Documentation and Measurement Validation

Each implication is briefly discussed in terms of specific research approaches that should be considered in addressing the basic skills learning strategies research needs for the Army Research Institute. Throughout this discussion, major research recommendations suggested by the BSRC Principal Investigators are referenced, when appropriate, to emphasize considerations for future research to be undertaken by ARI.

Strategy Identification, Definitions, and Parameters.   The BSRC research agenda included activities that were designed to identify and define learning strategies. Although several of the studies relied upon previously established definitions and strategy parameters, one exception was the ESL learning strategies study (O'Malley, et al., in press-a) which

61

initiated a catalog or inventory of strategies that were relevant to the acquisition of second languages. Activities related to the identification and establishment of definitions for learning strategies tend to rely upon self-reports provided by learners, direct observations, professional beliefs and judgements and/or experimental application and review. The lists and inventories generated through such activities attempt to represent the entire learning strategies field, particular components, or particular content areas. Although this is a logical first step, additional channels need to be explored in order to answer a finer set of operational questions. A series of such questions have been posed by MacKeachie (1984). Included are:

o   In what learning situations are particular strategies most appropriate?

o   Are particular strategies more appropriate for certain tasks, certain materials, certain learners?

o   When are particular strategies more effective or efficient?

o   Why are particular strategies more effective or efficient for particular learners, different learning environments, or various learning materials?

o   Are particular strategies more effective and efficient for particular learner characteristics?

Answers to these questions can be pursued through more detailed interviews with learners, teachers, and program managers. In addition, documentation of the training process must be included in future research efforts focused on strategy training. Both approaches must document the characteristics of the learner, the learning environment and the training materials and tasks.

These considerations are supported by the research recommendations identified through the ESL learning strategies study (O'Malley et al., in

press-b). Following the initial development of a catalog of strategies relevant to ESL, expanded research activities were suggested to build upon the initial definitions and parameters proposed. It was noted that the individual strategies should be analyzed in terms of their use by students and the rationale behind the learner's selection of strategies in undertaking language tasks. In addition, further information is required to understand the relationships between strategies and language skills such as the receptive skills of reading and listening.

The recommendations stemming from the study of the motivational skills training (McCombs, in press) also substantiates the need to identify the learner characteristics or differences that would predict the need for motivational skills training. Dansereau (in press) also notes that knowledge of learner characteristics would assist in tailoring the learning strategies training approach. That is, if the characteristics of the learner suggested motivational problems, the training approach could be tailored to include "mood management" techniques.

Learning Strategy Training Process. One of the central themes present in the BSRC research agenda is the consideration that individual students are different in their approach to learning. This implies that learning strategies can be trained in order to provide learners with alternate approaches to succeed in various learning environments. Much of the learning strategies research, including efforts completed through the BSRC research component, tend to show positive effects for various strategies and training approaches.

In the study of learning strategies training, it might be expected that training would pass through several stages as the learner acquires and applies the strategies being taught. First, as the learner approaches a task, he/she may rely upon an approach or strategy already familiar to the learner. Thus, application of the new strategy being taught could be hindered by the learner's normal approach to the task, thereby imposing restrictions and delays on the "effect" of the new strategy.

Second, as the learner becomes more skilled or practiced in the use of the strategy being taught, the "true effects" of the strategy would begin to surface. The learner's use of and practice with the strategy permits the learner to become confident in its use, allowing the learner to recognize and judge the potential of the strategy. It may be at this stage that the learner begins to decide to accept, reject, or modify the strategy. That is, if the learner determines that the new strategy is not as effective or efficient as his/her current strategies, then the new strategy could be rejected or possibly modified by the learner in order to maintain or contribute to an individual's learning process. The final stage in training is reached when the new strategy becomes familiar to the learner, allowing the "true effects" of the strategy to be determined.

There are several implications to be considered in undertaking future learning strategies training research in consideration of the above mentioned training stages. First, each of the individual stages should be studied in order to determine their duration and relationship to the learning strategy. This would help to define the time frame for training so that the "true effects" of the strategy can be identified once the new

64

strategy becomes familiar to the learner, rather than concluding the study during an earlier phase of the training process when minor, if any, effects can be demonstrated.

Second, during the training process procedures should be established to determine if learners are truly using the strategy as taught, have modified the strategy, or have rejected the strategy and are relying upon other more familiar strategies. Therefore, when "effects" or "no effects" are noted, the reasons for failure and/or success can be attributed appropriately.

Finally, these training stages should be reviewed and defined in order to determine if the duration of each stage is dependent upon the characteristics of the new strategy (e.g., complexity) being taught or upon the characteristics of the individual learner, such as the learner's familiarity with the strategy. Information about these concerns would provide direction to the identification of training parameters, such as length of training.

These considerations are supported by the BSRC research findings and have lead to several related recommendations. The study of computer-based learning strategy training modules (Dansereau et al., in press) has suggested that computer-assisted cooperative learning (CACL) was not as effective for more complex and unfamiliar strategies (i.e., structured summarization and networking). Thus, extended training time was recommended for future investigations of such strategies when linked to the CACL approach. In addition, the study of reading comprehension (Wittrock, in press) suggests that the complexity of the strategy and task interferes with the learner's ability to complete tasks effectively. It was noted

that developing written representations of relationships between the text and the learner's experiences is successful, but uncommon and difficult for learners who are considered poor writers. Thus, additional training/practice time and/or alternative but related tasks (e.g., developing graphic or verbal representations) should be considered.

The research on learning strategies relevant to English as a second language (O'Malley et al., in press-b) provides an indication that the vocabulary learning strategies taught to students of Asian ethnic backgrounds may have been met with some rejection since these learners at posttest appeared not to rely upon the strategies that had been taught during eight hours of training/practice. In addition, the strategy training incorporated as part of the ESL study included training on multiple strategies. It was noted that for students with low English proficiency, training should be quite simple and straighforward, and should initially include instructions on one strategy at a time.

Research Methodology. As previously noted, the BSRC research agenda provided an opportunity to review and rethink current definitions of learning strategies, goals established for strategy training and the conditions under which strategies are successful. As suggested by Mayer (1984), a review of research assumptions associated with learning strategies may lead to the consideration of definitions of strategies in terms of learner techniques used to influence targeted cognitive processes or the possibility of referencing learning strategies in terms of the goal(s) or learning conditions the strategies affect.

Given these considerations, it may be valuable to expand the approaches to research on learning strategies. Mayer (1984) has identified three approaches to research on learning strategies. These include: (a) a Behavioral Approach Model, (b) a Cognitive Approach/Quantitative Model and (c) a Cognitive Approach/Qualitative Model.

The Behavioral Approach Model considers whether or not instructional variables influence a change in related performance variables. Research under this model considers only the effects strategies have on particular performance outcomes. The Cognitive Approach/Quantitative Model examines whether or not instructional variables affect how much processing occurs and how much knowledge is acquired. This model incorporates a focus on cognitive process variables and cognitive structure variables. These variables are described in terms of how much processing is influenced and how much knowledge is acquired. Quantification of these variables assist in defining performance in terms of a total overall amount learned.

Finally, the Cognitive Approach/Qualitative Model examines instructional variables and their effect on the kind of processing and the structure of knowledge that is acquired. The focus of this model also incorporates cognitive process and structure variables. However, these variables are described in terms of the kinds of processing that occurs and how the knowledge acquired is organized. Thus, patterns of performance can be identified.

These themes are not directly apparent in the research implications and recommendations noted by the BSRC Principal Investigators. However, the

67

overriding tone of the recommendations established for future efforts to be initiated by ARI does provide a concern and focus for "process-related" information. Overall, several recommendations noted the need to understand and study the training process in terms of (a) tailoring the training approach and strategy selection to learner characteristics; (b) gathering information during training in order to determine if the strategies being taught are being used, modified, or rejected by the learner; and (c) determining the individual contributions of strategies and training approaches when treatments consist of multiple strategies and/or approaches.

Documentation and Measurement Validation. The consideration discussed above moves the learning strategies inquiry process into new areas that impose special problems. For example, implementation of a research agenda that takes into consideration cognitive process and structure variables most likely would require the development of unique instruments that would provide the necessary qualitative and/or quantitative variable measures. In addition, appropriate measures would need to be identified to properly document performance effects. These concerns are not new to researchers in the learning strategies research field. Such issues are currently prevalent. These include: development of procedures and instruments to ascertain learning strategy transfer following instruction and training, validation of questionnaires and inventories designed to identify learning and/or study strategies, and identification of process measures which reflect strategy use during training.

Many of the BSRC research studies undertook tasks that were unique to particular settings, content areas, and/or student groups. These unique

features often required that new techniques, instruments and applications of research procedures be implemented. Thus, several of the recommendations stemming from the BSRC research agenda suggest additional and similar testing of the strategies and procedures prior to their full acceptance. For example, McCombs (in press) suggests the development of defined measures of the knowledges and skills acquired through the motivational skills training, and O'Malley et al. (in press-b) recommend further development and validation of the Learning Strategies Inventory utilized in the ESL learning strategies study.

In summary, learning strategies research to be undertaken by the Army Research Institute should include, when appropriate, a focus on the following items:

o   Consideration and documentation of the learner's background prior to the development of learning strategies training materials.

o   Documentation of "process variables" (e.g., learning environment, materials, tasks) that influence strategy selection and effectiveness.

o   Documentation of learner characteristics that impact on the effectiveness and efficiency of learning strategy use.

o   Delineation of the learner's interaction with the learning strategy training process/construction.

o   Expansion of learning strategy research approaches to incorporate qualitative and/or quantitative measures of cognitive variables and structures.

o   Acquisition of measures necessary to validate the development and application of instruments utilized in the research process.

The pursuit of new research that considers the implications discussed in this section of the BSRC Final Report will enhance the knowledge acquisition process related to the application of learning strategies to

Army training and educational activities. Such research endeavors should prove to be key steps to the advancement of the learning strategies research field.

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